

Bat use of Abandoned Mines in the Pryor Mountains

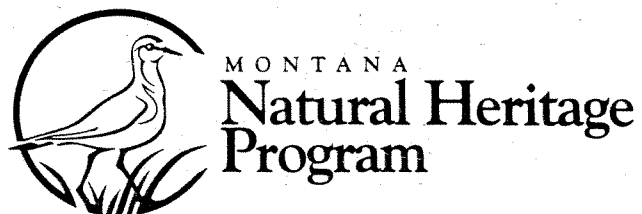
A Report to:

**Montana Department of Environmental Quality
Mine Waste Cleanup Bureau
2209 Phoenix Avenue
Helena, Montana 59620-0901**

Submitted by:

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Summary

We surveyed ten workings at six abandoned mine sites (Swamp Frog, Marie, Dandy, Roberts Incline, CM & M, Lisbon) on the southern slope of Big Pryor Mountain in the Pryor Mountains, Carbon County, Montana, for evidence of use by bats in the summer of 2001. This aggregation of mines, spread along two linear miles between 5380-6800' elevation, was "reclaimed" in 1989, but reclamation involved primarily the posting of warning signs at portals and construction of fence barriers around open shafts and pits. Thus, several mine workings were still accessible to bats.

We inspected and trapped at mines during three visits: 17-18 July, 24-29 July, and 4-6 September, 2001. We made complete or partial internal inspections of eight workings and found scattered bat droppings in seven of these. During eight nights of trapping at six portals of four mines we captured 48 bats of three species: 21 Western Small-footed Myotis (*Myotis ciliolabrum*), 15 Western Long-eared Myotis (*Myotis evotis*), and 12 Big Brown Bats (*Eptesicus fuscus*). The two *Myotis* species are U.S. Fish and Wildlife Service species of special concern. No Townsend's Big-eared Bats (*Corynorhinus townsendii*), another special concern species, were captured or detected, although this species has been documented in winter at two of these mine workings. We heard the audible calls of Spotted Bats (*Euderma maculatum*), another special concern species, early in the morning of 18 July, 25 July, and 29 July over the Swamp Frog, Dandy, and Roberts Incline mines, respectively, but found no evidence of mine use by this species.

We recommend that the Dandy Upper West Adit #4 and the Marie, two workings with extensive underground passage, be considered for bat-accessible gating. Summer bat activity was significant at the Dandy working (83% of our total captures), a documented Townsend's Big-eared Bat hibernaculum. The Marie site, although currently experiencing relatively little summer use by bats (4% of our total captures), has the potential to become a significant site for bats if protected from human intrusion.

Acknowledgments

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INTRODUCTION

Exploration and exploitation of uranium deposits on the southern exposures of the Pryor Mountains in Carbon County of south-central Montana, quickly developed in the 1950's and declined about as rapidly in the 1960's. Although the majority of workings are little more than prospect pits or scrapes and most underground workings extend only a few yards, a few abandoned mine sites include workings with more extensive underground passageway. Reclamation of abandoned mine workings in 1989 included posting warning signs at portals and construction of fencing around open pits and shafts at sites with the most significant underground workings. Thus, several underground workings remain accessible both to bats and humans despite reclamation efforts.

Perhaps because of the abundance of natural caves in the Pryor Mountains (Campbell 1978), the area is occupied by a relatively large diversity of bat species, ten species documented so far (Worthington 1991). Six bat species that could occupy abandoned mines in the Pryor Mountains (Western Small-footed Myotis [*Myotis ciliolabrum*], Western Long-eared Myotis [*M. evotis*], Little Brown Myotis [*M. lucifugus*], Long-legged Myotis [*M. volans*], Big Brown Bat [*Eptesicus fuscus*], Townsend's Big-eared Bat [*Corynorhinus townsendii*]) are known from Pryor Mountain caves (Worthington 1991). Of these six species, four (excepting Little Brown Myotis and Big Brown Bat) are considered species of special concern by the U. S. Fish and Wildlife Service (Harvey et al. 1999).

There have been few efforts to systematically document bat use of caves in the Pryor Mountains, with the notable exception of Worthington (1991). Documenting bat use of abandoned underground mines in the Pryor Mountains has received less attention, even though mines have supplemented or replaced caves as key year-round bat habitat in many regions of the United States (Tuttle and Taylor 1994). The primary objectives of our field work in summer 2001 were to: 1) assess the use by bats of several mine sites with underground workings still accessible to them, and 2) offer suggestions for protection of significant bat roosting habitat from human disturbance, should such habitat be identified.

STUDY AREA AND METHODS

The Pryor Mountains of Carbon County, Montana lie near the Wyoming border to the west of the Big Horn River, and are separated from the Big Horn Mountains by the impressive gorge of Big Horn Canyon. The Pryor Mountains are a series of asymmetric anticlines forming four major uplifted mountain blocks (Campbell 1978), one of which is the Big Pryor Mountain block where a series of abandoned uranium mines are located. Nearly all of the surface rock of the Pryor Mountains is uplifted Madison Group limestone, which harbors numerous solution caves in the upper portions of the Mission Canyon Formation. Base elevation on the southern slopes of Big Pryor Mountain in Montana is 4600', reaching 8786' at the summit.

A series of abandoned uranium mines are found between Gypsum Creek to the west and Crooked Creek to the east. They range in elevation from 5380-7800' and are located on the south-facing slope of a spur ridge leading to Red Pryor Mountain on the summit ridge of Big Pryor Mountain. This cluster of abandoned mines was the focus of reclamation activity in 1989

by Spectrum Engineering (Spectrum Engineering 1990), but reclamation did not include evaluation of the mine workings for use by bats.

Our 2001 assessment focused on the mine workings on BLM lands between the Swamp Frog (5380') and the Lisbon (6800') mines, and also included the Marie, Robert's Incline, Dandy, and CM & M mines, all within T9S, R27E (Fig. 1). We excluded visits to the highest-elevation mines, on U.S. Forest Service lands in T 8S, R 27E (Old Glory [=Ponderosa] and Sandra mines), because of deteriorated roads and prior indication of limited or low potential for use by bats (Madson and Hanson 1993, Martinez 1995). Landscapes at all mine sites we visited were dominated by limber pine-juniper-sagebrush habitat, with some Douglas-fir intermixed at the higher sites.

We inspected mine workings and trapped bats during three visits in summer 2001: 17-18 July, 24-29 July, and 4-6 September. For each mine site, we documented the presence of open portals and noted portal dimensions, obstructions, and the presence of bat spoor. Workings deemed safe for entry were examined for the presence of bats or bat sign, and internal dimensions measured with a cloth tape or estimated. Mine ambient temperature and relative humidity, when recorded, were measured with a sling-psychrometer.

Bats were captured at portals using 50-denier mist nets of various lengths (usually 8' or 18'), depending on dimensions of the portal. We used an electronic bat detector (ANABAT II; Titley Electronics, Ballina, Australia) to aid with detecting the presence of bats in the area while we operated mist nets. Typically, nets were deployed at dusk and operated for at least 3-4 hours (often until midnight or later). Captured bats were identified with aid of keys in Nagorsen and Brigham (1993) and Foresman (2001b); individuals were sexed, aged, measured (forearm, weight), reproductive status noted, then released.

RESULTS

The sequence of mines presented below is arranged from lowest to highest elevation. Names for mine workings and reclamation sites follow Spectrum Engineering (1990).

Swamp Frog (T9S, R27E, Sec. 17NESE). We visited this mine site (5380' elevation) on 17 July, and netted at the two shallow adits of the "Central 1 Site." The two adits are approximately 8-10' apart. The north adit is very shallow (10') with passage about 8' x 8' in height and width, the south adit is a simple relatively level working of same dimensions about 85' in extent with a partially collapsed entrance about 3' x 8'. A few scattered bat droppings were present in the south adit, but no bats were seen.

We deployed a net across the portal of the south adit, but captured no bats in three hours. However, we noted 8-10 passes at and into the north adit by perhaps 3-4 individuals of an unidentified *Myotis* species. During our walk out (at 00:15 on 18 July) we briefly heard the audible clicking of a Spotted Bat (*Euderma maculatum*) flying above us in the Swamp Frog "Central 3" area.

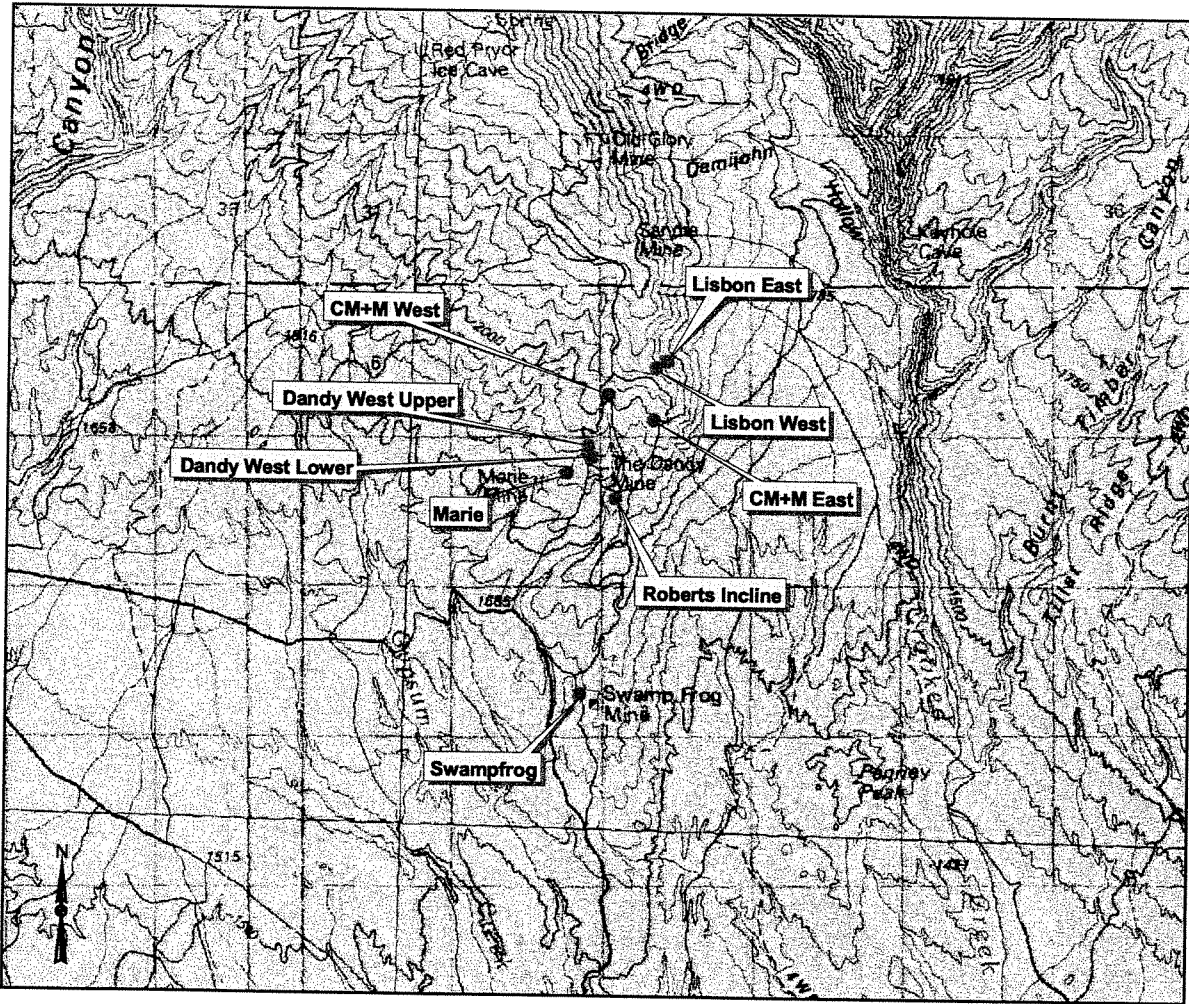


Figure 1. Mine workings surveyed for bats during the summer of 2001.

Robert's Incline (T9S, R27E, Sec. 9NWSW). We trapped the portal of this site (5865' elevation) on the night of 28 July. The portal (about 6' tall x 8' wide) is in a matrix of unstable rock, supported by a partially collapsed headframe. This working, actually a decline, was not inspected internally because of the partial collapse of the passage, but from the portal appeared to be a simple working extending at least 80' (Martinez [1995] states the adit extends >200').

We recorded slight activity in the area during three hours, and captured only two male Western Small-footed Myotis entering the portal (Table 1). We briefly heard Spotted Bat calls upslope from the portal at 00:20 on 29 July.

Table 1. Summary of bats captured at abandoned mines in the Pryor Mountains, Carbon County, Montana in summer 2001. MYCI = *Myotis ciliolabrum* (Western Small-footed Myotis), MYEV = *Myotis evotis* (Western Long-eared Myotis), EPFU = *Eptesicus fuscus* (Big Brown Bat). M = male, F = female.

Mine working	Date	MYCI	MYEV	EPFU
Robert's Incline	28 Jul	2 M		
Marie	24 Jul	1 M		1 M
Dandy West "Adit 4"	25 Jul	3 M	2 M, 3 F	1 M
	4 Sep	13 M, 1 F	5 M, 1 F	4 M, 3 F
	5 Sep		3 M, 1 F	
Dandy West "Adit 5"	25 Jul			3 M
Dandy West "Adit 6"	27 Jul	1 M		
Total		20 M, 1 F	10 M, 5 F	9 M, 3 F

Marie (T9S, R27E, Sec. 8SENE). This mine (6000' elevation) has over 950' of workings on two levels. From the portal (8.5' tall x 14' wide) the mine descends at a moderate angle for 440' where it intersects perpendicular passage running east and west. There is a second level of workings at this point, accessed through a dome-like stope or nearby ore chutes in both sections (east and west) of perpendicular passage. Mine temperature and relative humidity at the intersection on 25 July were 46.5 °F and 90%, respectively. There are several side workings off of the west passage, which is level and extends 242' to the drift face, where it was 47.0 °F with 85% relative humidity. The east passage ascends slightly for 121' to the drift face, where it was 49.5 °F with 84% relative humidity. We found scattered *Myotis* droppings in both sections of the east-west perpendicular passage, but saw no bats on either visit underground (25 July and 5 September). There was also evidence of recent human visitation throughout the mine, but especially in the decline from the portal to the perpendicular passage. Evidence included spent fireworks, charred firewood, boot prints, and discarded beer cans.

We netted the portal for four hours on the night of 24 July. There was slight bat activity at the portal, and we captured only two bats (Table 1), a male Western Small-footed Myotis and a male Big Brown Bat attempting to enter the mine.

Dandy (T9S, R27E, Sec. 8NENE). This mine includes numerous workings spread over a relatively wide area. Our attention was focused on two workings (adits 4 and 5) in the “Dandy West Upper” site (6110' elevation) and one working (adit 6) in the “Dandy West Lower” site (6030' elevation). Most other sites in the Dandy Mine area are very shallow or lack underground workings. We inspected the three adits on 25 July and 5 September.

“Adit 4” is the most extensive of the three workings, apparently with three levels (Madson and Hanson 1993), the portal being on the upper-most level. We were unable to explore the working beyond the first 120' (where we detected a lower level) because of standing water and deep mud that accumulated in early July from a severe thunderstorm; standing water and mud were still present on 5 September. The portal is immediately adjacent to a dry gully that directs runoff into the mine working, which is a decline beyond the portal. The adit splits about 70' beyond the portal (and about 40' beyond a ceiling opening to the surface), with the left branch leading to the lower workings, and the right branch about 60' long leading to a drift face. Water pools in the right branch on this upper level of the mine. “Adit 5” is about 65' east of “Adit 4”, and declines slightly beyond the portal for about 120' to the drift face (deep mud prevented complete inspection of this working). Passageways in both adits are large (at least 8-10' wide x 8-10' high, and the portals of both are unobstructed. We found evidence of recent human visitation (boot prints in the mud), but conditions made it difficult to detect bats or bat droppings

“Adit 6”, down-slope from the other two, is a single level decline extending 345' to the drift face. There are no significant side-workings off of the main passage, but there are two areas where domes have been created along the passage. The passage declines 177' to the first dome (46 °F and 94% relative humidity on 25 July), then is level thereon to the drift face (same temperature and relative humidity). The portal is partly blocked by a wooden head frame and cross-bracing. We found some evidence of recent human visitation (boot prints and trash). We found not bats during our two inspections but noted scattered *Myotis* droppings below a dome near the portal and at the drift face.

At “Adit 4” we captured nine bats in four hours on 25 July (Table 1): three male Western Small-footed *Myotis*, two male and three lactating female Western Long-eared *Myotis*, and one male Big Brown Bat. On 4 September we captured 27 bats in three hours: 13 male and one female Western Small-footed *Myotis*, five male and one female Western Long-eared *Myotis*, and four male and three female Big Brown Bats. On 5 September netting ceased after two hours because of rain, but we captured three male and one female Western Long-eared *Myotis*. At “Adit 5”, netted only on 25 July, we captured three male Big Brown Bats. At “Adit 6”, netted only on 27 July, we captured a single male Western Small-footed *Myotis* in three hours. In all cases, bats were entering the mine workings when caught, although some bats at “Adit 4” entered via the ceiling opening and then were caught exiting the portal. We also heard Spotted Bat clicking overhead at the “Dandy West Upper” site (near adits “4” and “5”) for about 5 seconds at 01:45 on 26 July.

CM & M (T9S, R27E, Sec. 4SW). On 27 July we checked two workings at this mine site, both adits, for evidence of use by bats: “CM & M West” in Sec. 4SWSW (6500' elevation), and “CM & M Pit” in Sec. 4SESW (6470' elevation). The “West” adit is short (28' of level passage) with a walk-in portal 9' tall x 9' wide leading to an open pit at the other end. Scattered *Myotis*

droppings were present in the passage, but no bats. The adit at the "CM & M Pit" is more substantial. The portal, behind barb-wire fencing, is an open timbered headframe leading to a simple decline about 8' tall x 10' wide extending about 360' to the drift face. There are no side passages. We found scattered *Myotis* droppings and a few larger bat droppings (*Eptesicus*?) near the drift face. Neither of the CM & M workings were monitored overnight.

Lisbon (T9S, R27E, Sec. 4NESW). Two workings at this mine site, both adits, were visited on 25 and 26 July: "Lisbon Point East" and "Lisbon Point West." The "East" adit (6800' elevation) is a level working extending about 92' beyond an open portal 6.5' tall x 16' wide. There are three areas of side-workings extending only a few feet along the passage. No bats or bat droppings were noted. The "West" adit (6800' elevation) is apparently an active working once again, renamed "Pack Rat Load Claim" and posted on 31 October 1997 by the claimant, C Tucker (P.O. Box 22575, Billings, MT 59104). The portal is blocked by a locked gate of rebar (20 x 20 cm spacing) in a wooden frame. Beyond the portal is a decline visible for about 100' (Madson and Hanson [1993] state the passage extends about 200'), in which are stored a variety of mining supplies. Outside of the portal is a generator protected by a plywood barrier. The site is posted "No Trespassing", and the entire Lisbon Mine site is behind a BLM Closed Road sign. There were recent ATV tracks in the road to the "East" adit.

DISCUSSION

Our summer trapping at the abandoned mines on the south side of the Pryor Mountains in T9S, R27E resulted in capture of three species of bats at five workings (Table 1): Western Small-footed *Myotis*, Western Long-eared *Myotis*, and Big Brown Bat. In addition, we heard Spotted Bat on three nights at three sites, but these animals were probably passing between foraging areas and roosting cliffs, as this bat is not thought to be a mine-dwelling species (Tuttle and Taylor 1994, Foresman 2001a). The three species of bats we captured at the mines are found throughout Montana, although there exist large gaps between documented locations (Foresman 2001a), even for the cosmopolitan Big Brown Bat. Despite broad continental distributions, Western Small-footed *Myotis* and Western Long-eared *Myotis* are U.S. Fish and Wildlife Service species of special concern (Harvey et al. 1999) because of unknown or declining population trends and overall vulnerability. Sites where significant activity of these two species is documented probably should be considered for protection, if such measures are not already in place.

Our 2001 assessment showed that most of the abandoned mine workings still accessible to bats were used by them in summer to greater or lesser extent, corroborating the findings of Martinez (1995) based on bat detector surveys. Most of the mine workings we inspected were likely used primarily as temporary summer night roosts, as mines affording the greatest protection for maternity roosts were generally too cold, and other workings were too shallow to offer stable environments for hibernating bats during extreme fluctuations in winter weather. Furthermore, most workings appeared to be visited by humans often enough to disturb any summer colonies that might otherwise develop in warmer locations near portals. This is especially true for Townsend's Big-eared Bat (*Corynorhinus townsendii*), another bat species of special concern that is resident year-round in the Pryor Mountains (Worthington 1991, Madson and Hanson 1993).

It was evident to us that the Dandy West Upper "Adit 4" was an significant source of summer water for three species of bats in this arid landscape, as we saw several bats drinking from the standing water visible beyond the portal. The presence of water may contribute to the abundance of bat activity at this mine working, but it may be attractive to bats in summer for reasons other than just access to water. The relatively extensive underground workings offer significant roosting habitat, and this adit is a documented hibernaculum for Townsend's Big-eared Bat and at least one species of *Myotis* (Madson and Hanson 1993). All evidence indicates that the Dandy West "Adit 4" is important habitat for bats in this area of the Pryor Mountains.

The Marie Mine is another extensive working of size and complexity comparable to the Dandy "Adit 4" (Madson and Hanson 1993) that appears to provide important stable winter roosting habitat for bats, even though summer activity was close to minimal during our field assessment. No bats were found during the only winter inspection (Madson and Hanson 1993), but the amount of disturbance caused by human visitation to this mine in September and October, after bats in Montana normally enter hibernacula (Hendricks et al. 2000), may preclude bats from using the mine as a hibernaculum.

We can say little about current use by bats of the Lisbon "West" adit, because it is now locked in relation to recent mining activity. Nevertheless, bats are capable of passing through the locked gate and may still use the mine as a night roost in summer and a hibernaculum in winter. Madson and Hanson (1993) found a Townsend's Big-eared Bat and at least one species of *Myotis* hibernating in this working in March 1992, indicating it provided important bat habitat to a limited number of individuals. Martinez (1995) documented moderate activity at the portal of this mine in summer 1995.

We documented limited bat activity at the Swamp Frog "Central 1 Adits", Robert's Incline, and Dandy West "Adit 6", and found some sign of bat use at the "CM & M Pit" adit. Our observations are similar to survey results by Martinez (1995) for the same workings, indicating their use by bats is mostly for summer night roosts. All workings are susceptible to unauthorized human intrusion.

MANAGEMENT SUGGESTIONS

Based on our summer 2001 assessments of these abandoned mines and limited information from previous surveys (Madson and Hanson 1993, Martinez 1995) we suggest the following:

- 1) Install bat-friendly gates secure from vandalism on the Marie Adit and Dandy West Upper "Adit 4." These two workings are the most extensive and complex and offer the widest variety of bat roosting habitat in the collection of mines surveyed. Human visitation to these sites appears to be a regular occurrence, and probably will increase with continued ATV recreation in the Pryor Mountains. The Dandy "Adit 4" has a history of bat use at all seasons and is a documented Townsend's Big-eared Bat hibernaculum, and the Marie has the potential to be used in like manner if protected from unauthorized human intrusion.

- 2) Consider installing bat-friendly gates on the Robert's Incline, Dandy "Adit 6" and "CM & M Pit" adit. Each is extensive enough to offer bat habitat for small numbers of bats, and bat activity has been documented at each working. These workings could be used more often by bats if protected from unauthorized human intrusion.
- 3) Support addition surveys at each of these workings to fully document their seasonal use and significance for bats. For workings where bat-friendly gates are installed, conduct surveys both before and after gate installation to document the utility of the gate design.

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